

MICROTEK

In - C i r c u i t E m u l a t o r s

for
NS486™ Processors

Helps You Solve Today's Most Difficult Software-Hardware Integration Problems

If you are an engineer designing embedded systems on an aggressive schedule, you will appreciate the practical features that make the PowerPack® NS486 In-Circuit Emulator powerful and easy to use.

The full-featured PowerPack EA-NS486 In-Circuit Emulator integrates the capabilities of a powerful software debugger, the traditional features of an emulator, and the state analysis of a logic analyzer in one tool. The industry's most sophisticated trace and triggering system shows you details of your runtime system that are invisible with any other tool, like source code and related clock-edge hardware events of your real-time target system. The small probe size and flexible cables also make it easy to plug into the tightest embedded targets.

Three examples illustrate the debug power of the EA-NS486. Obviously there are many other examples that could be used and many more real world problems that the PowerPack family of emulators are capable of solving.

One of the most common problems that occur during the integration stage of development is the Ready Hang. It can occur for a number of reasons, one is when a reference is made to a memory location that does not actually have memory.

This problem frequently occurs because the software development environment that was used prior to hardware being available provided RAM at that location and the real target hardware does not. It can also be a symptom of an improperly dereferenced pointer that is pointing to the wrong address. The resulting situation is the processor stops processing, a situation commonly referred to as "Ready Hang". The problem is exaggerated because a bondout processor, used in the most powerful emulators, will respond to commands at the end of a completed bus cycle. Since the RDY# never occurs, the processor never responds to commands and the development tool designed around the bondout processor is also "hung". Normally the only way out of this situation is to reset the processor, which loses some of the important debug information.

Solution: the solution for the NS486 processor is to setup a trigger that will count clock cycles within a bus cycle and provide a maximum count that would not be exceeded under normal conditions. If the maximum is exceeded the trace system automatically halts prior to the hang condition. If the bus cycle completes before the count completes, the

emulator will reset the trigger and start again. The best place to start counting clock cycles when the Address has been qualified. Then you count until the Bus cycle complete signal is generated within the emulator. So you set up a trigger that begins the clock count when the Address becomes valid and count 20 clocks or until the RDY# occurs.

Another type of debugging problem occurs when assessing the interrupt latency of a complex system.

Suppose when a hardware event occurs you have 600ns to begin the interrupt service routine. Here you have an event, which is a hardware request for interrupt services, and a problem of measuring time to actual service. The problem is providing a method to measure the time between the hardware event and the beginning of the service routine. Time cannot be done by measuring bus cycles, since bus cycles have different numbers of clock cycles, you must measure the time absolutely.

Solution: The PowerPack EA-NS486 includes 8 independent triggers that monitor most address, data, control and status signals. External signals can also be monitored and included into the trace. These triggers are integrated with powerful counters and timers to allow easy real time detection of interrupt service latency that violates system requirements. In this case, set up a trigger such that when the

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hardware event signaling the interrupt occurs, the counter begins counting clock cycles. When you reach 20 clock cycles, you have 600ns (@33.3 MHz) and the emulator will halt (i.e. detect the 21st clock) if this is exceeded. If you get to the interrupt routine in less than 600ns, the emulator will reset the trigger and immediately begin searching for the next violation.

Many integration problems can be solved faster with the extensive trigger capability of the EA-NS486.

An example of this might be the writing of a message buffer in a communications application. In this case there are ranges of allowable values for the data, which must be written into the buffer at certain locations. The idea is to halt the emulator if anything other than an allowable value is written into the buffer. Consider if the ranges of allowable values are the ranges (0 ... 40), (100 ... 140), and (200 ... 240) within three address ranges. You would setup the triggers that quali-

fy every write to the buffer and check for the given address and data range. If any of these or'd events were reached, the emulator will generate a trigger which can force a breakpoint, or a number of other emulator actions.

Solution: There would be three events with address and data ranges as follows:

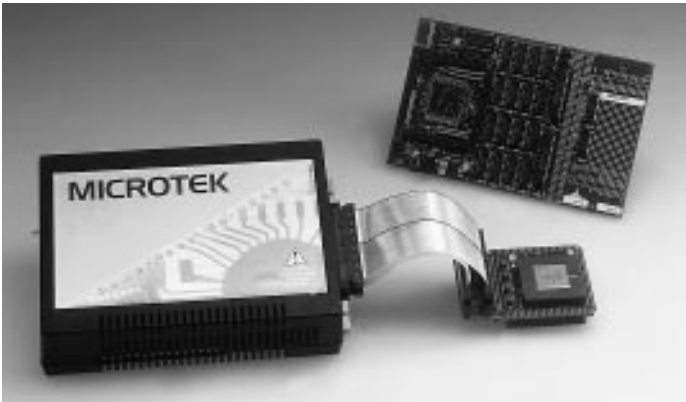
event1 = address range(1000:0000 to 1000:0255) NOT data (0 to 40)

event2 = address range(1000:0256 to 1000:0275) NOT data (100 to 140)

event3 = address range(1000:0276 to 1000:0300) NOT data (200 to 240)

If you are within the address ranges of the communication buffer, but the data is NOT within the allowed data ranges, a breakpoint will occur. Even triggers of this level of sophistication only require 3 of the eight events available in the EA-NS486. These type of premium capabilities may seem unnecessary until you need them.

PowerPack® EA-NS486



The EA-NS486 emulator provides full processor control features for debugging during development. It provides a view into the NS486, showing the NS486-based registers and all integrated peripheral control registers.

For the most demanding problems, where hardware timing issues are affecting performance, incorrect memory reads and writes are affecting software operation, or you need to gather critical timing information on particular functions, the EA-NS486 provides 160-bit wide clock resolution trace to allow the engineer to track back and discover the problem. The user can view trace with clock cycle or bus cycle resolution or show only executed code, aligned with the data reads and writes that have occurred. A 40-bit time stamp is included to allow careful analysis of timing issues within portions of your code. The EA-NS486 trace includes qualifying hardware that allows the user to capture only the bus cycles of interest. This can be especially useful when debugging events

that occur infrequently in the code.

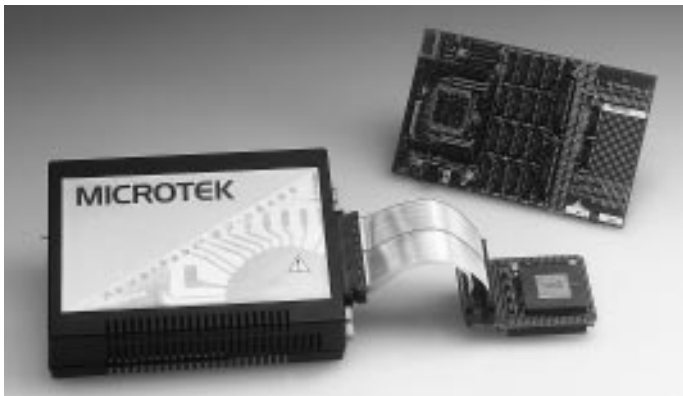
A key feature that is rarely considered until it is "too late" is the emulator's probe size. Probe insertion is a mechanical issue that can cause much extra work if the development tool is not flexible. Microtek's emulators provide a probe tip that is not much bigger than the processor itself. The probe tip connects to the emulator by flexible four inch cables. The result is a probe that is easy to install in most hardware targets. The overall small size of the emulator coupled with this probe tip and flexible cable make it easy to create simple fixtures to hold the emulator in place.

Confidence in the emulator is extremely important during product iterations. After many years of emulator design we have come to understand the necessity of a "gold standard" target available to check the development tool. When working with a target that is under constant revision the situation often arises where the emulator will not run the target as expected. The design engineer at this stage often questions whether the target or the emulator has experienced a failure. To address this issue, Microtek developed a "Gold Standard" target system that ships with every EA emulator. The stand alone self-test board (or SAST) coupled with our built in test procedures check out the complete operation of the emulator. If the emulator is able to run our full suite of tests in the self-test board, then the engineer has a very high degree of confidence that the emulator is functioning correctly. Using a self-test board insures every functional block of the emulator is tested, including all of the control signals that interface to the target system.

System Features at a Glance:

- Supports 25 MHz NS486 processors
- Auto detects 3 volt or 5 volt operation
- Collects trace with clock edge resolution
- 256k deep, 160 bit wide trace
- Trace records address, data, status and timestamp
- Timestamp using a 40-bit timer with a granularity of 40 Ns.
- Qualified Trace allowing the trigger system to specify which microprocessor cycles will be captured
- Supports protected mode operation
- Source Level Debug for toolchains that produce OMF-86 and OMF-386 output
- 256 Software Breakpoints
- Triggers allow the user to specify up to eight independent complex events.
- Execution Breakpoints implemented using the NS486 debug registers
- Ability to single step at the source or assembly level
- Trigger In/Out for cross triggering with other instrumentation
- View and edit internal registers
- Detailed self-test diagnostics with self-test hardware
- State-of-the-art design provides very low target signal loading
- Overlay memory available in 1 megabyte or 4 megabyte size

PowerPack® SW *Plus* NS486



Microtek understands that not all projects require the extensive features of the EA-class of emulator. For projects with a tight budget, the SW *Plus* class of emulator is the perfect choice. Just like the EA-class emulator it provides a view into the NS486-based registers and all the integrated peripheral control registers. Important processor control features are supported including: software breakpoints, execution breakpoints, single stepping, stepping through function calls, and breaking on memory writes to data space or memory access to I/O space. For more difficult problems where software is losing control of the processor, or unexpected error routines are being called, the emulator provides execution trace to allow the engineer to track back and discover the problem.

System Features at a Glance:

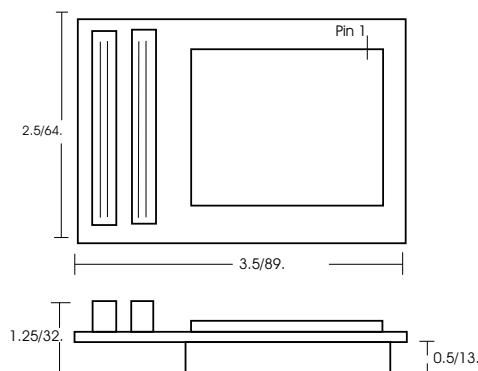
- Supports 25 MHz NS486 processors
- Auto detects 3 volt or 5 volt operation
- 256k deep, 160 bit wide trace
- Trace records address, data, status and timestamp
- Timestamp using a 40-bit timer with a granularity of 40 Ns.
- Qualified Trace allowing the trigger system to specify which microprocessor cycles will be captured
- Supports protected mode of the processor
- Source Level Debug for toolchains that produce OMF-86 or OMF-386 output
- 256 Software Breakpoints
- Triggers allow the user to specify up to eight independent complex events.
- Execution Breakpoints implemented using the NS486 debug registers
- Ability to single step at the source or assembly level
- Trigger In/Out for cross triggering with other instrumentation
- View and edit internal registers
- Detailed self-test diagnostics with self-test hardware
- State-of-the-art design provides very low target signal loading
- Overlay memory available in 1 megabyte or 4 megabyte size

PC Host Requirements

PowerPack SLD requires a 486 or better PC (Pentium recommended) with a minimum of 8 megabytes of RAM (16 recommended for Win95) running Windows 3.1, 3.11, Win95, or Windows NT, an SVGA or better color monitor, 3.5" floppy drive, a free serial port and a mouse.
 Electrical Input . . . 100-120 VAC, 200-240VAC, 47-63 Hz
 Consumption 50W (max), 25W (typ)

Environmental

Operating Temperature 10 to 35°C
 Storage Temperature 10 to 50°C
 Relative Humidity 20 to 80%
 Shipping Weight 8 lbs.



NS486 Adapters

The NS486 probe requires at least one target adapter.
 Emulation Technologies (ET)

For SXF Processor:

160 pin to 160 pin Clip Over	PP-ET-160CQFPCO	160-pin square pin to 160-pin CQFP clip over adapter
160 pin to 160 pin Solder Down	PP-ET-160QFSPD	160-pin square pin to 160-pin CQFP solder-down adapter

For SXL Processor:

132-pin to 132-pin Clip Over	PP-ET-132QFPCO	132-pin square pin to 132-pin PQFP clip over
132-pin to 132-pin PQFP solder pads	PP-ET-132QFSPD	132-pin square pin layout to 132-pin PQFP solder pads
132-pin to 132-pin socket	PP-ET-132SM-AMP	132-pin square pin layout to 132-pin AMP socket
132-pin to 132-pin socket	PP-ET-132SM-3M	132-pin square pin layout to 132-pin Textool socket

PRODUCT CODE

DESCRIPTION

PP-EA-NS486SXF	PowerPack EA-NS486SXF	PowerPack EA-NS486SXF emulator, 25 MHz, SAST, 256K trace, no overlay
PP-EA-NS486SXL	PowerPack EA-NS486SXL	PowerPack EA-NS486SXL emulator, 25 MHz, SAST, 256K trace, no overlay
PP-SW Plus NS486SXF	PowerPack SW Plus NS486SXF	PowerPack SW Plus NS486SXF emulator, 25MHz, no trace, no overlay
PP-SW Plus NS486SXL	PowerPack SW Plus NS486SXL	PowerPack SW Plus NS486SXL emulator, 25 MHz, no trace, no overlay
PP-OVMHS-1MEG	Overlay Memory	Zero wait state overlay memory module, 1 megabyte
PP-OVMHS-4MEG	Overlay Memory	Zero wait state overlay memory module, 4 megabytes
PP-SXF-SAST	Self Test Board	SXF Stand Alone Self Test Board
PP-SXL-SAST	Self Test Board	SXL Stand Alone Self Test Board
PP-SLD	PowerPack SLD	PowerPack SLD software package, current version
GOLD-2Y	Gold-2-Year	Gold-2-Year provides 2 years of support for new equipment
GOLD-1Y	Gold-1-Year	Gold-1-Year provides 1 year of support for new equipment
GOLD-1R	Gold-Renewal	Gold-Renewal extends existing Gold Support for one year
GOLD-1D	Gold-Discontinuous	Gold-Discontinuous provides coverage to equipment when not currently covered

Service Support Options



Products are warranted against defects in materials or workmanship for a period of 90 days. Contact your sales representative for information on our Gold Support Program – this provides hardware, software, and firmware updates, plus repair coverage for your emulator.

For more information about Service Support Options to match your project requirements, contact Lisa Rice at (800)886-7333x4038.

FAX



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WEB SITE



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